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The Many Meanings/Aspects of Emotion: Definitions, Functions, Activation, and Regulation

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Abstract

Many psychological scientists and behavioral neuroscientists affirm that "emotion" influences thinking, decision-making, actions, social relationships, well-being, and physical and mental health. Yet there is no consensus on a definition of the word "emotion," and the present data suggest that it cannot be defined as a unitary concept. Theorists and researchers attribute quite different yet heuristic meanings to "emotion." They show considerable agreement about emotion activation, functions, and regulation. The central goal of this article is to alert researchers, students, and other consumers of "emotion" research to the multiple meanings or aspects that distinguished scientists attribute to "emotion," increase appreciation of its interesting and challenging complexity, and sharpen perspectives on "emotion" and the associated body of literature that is of critical significance to science and society.

Keywords
activation, emotion, functions, regulation

Over the past three decades, emotion, its neural substrates, activation, regulation, and functions have become hot topics in many areas of psychology and related disciplines. Only three decades ago, however, it was difficult to find books and empirically based journal articles on emotion. Now we have a cornucopia of emotion books—amazon.com has 347,272 titles, and it is not unusual for a university library to have more than 400 scholarly books on the topic. Today there are at least five scientific journals with "emotion"[1] in their titles and there are many more that publish research on emotion, resulting altogether in 2,732 articles in the past decade. There appears to be more agreement on the significance of emotion and much greater acceptance of its place in science than was evident 25 years ago. Yet there is still no consensus on a definition of "emotion," and theorists and researchers use "emotion" in ways that reflect different meanings and functions.

Over a quarter of a century ago, researchers compiled a list of 92 definitions of "emotion" and nine skeptical statements about "emotion" from textbooks and journals (Kleinginna & Kleinginna, 1981). On the basis of the prominence of identified phenomena or theoretical issues, they sorted the definitions into 11 categories: affective (phenomenal) experience, cognitive, physiological, emotion/expressive behavior, disruptive, adaptive, multiaspect, restrictive, motivational, and skeptical statements about the utility and status of the word "emotion" in science. Though some skepticism may always be useful, it cannot negate the progress scientists have made during the 56 years since Skinner (1953) declared that emotions are among the fictional causes to which we commonly attribute behavior. Though incompatible with some interpretations of Skinner's stance, the data presented in this article raise questions about the possible inconsistencies, confusion, and costs to science and society should researchers fail to specify the meaning that they attribute to the word "emotion" or to the aspect of emotion under consideration.

To accomplish the goals of this article, the author began by asking outstanding scientists who have done significant research

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on emotion to answer six questions on its nature. Hopefully, highlighting their different conceptualizations of "emotion" will sharpen our understanding of the construct and its aspects, and help in understanding the extant literature and framing future research.

Method

Four sets of data were obtained. The first set consists of scientists' answers to a six-item survey on the definition, activation, and functions of emotion and topics for future research. The second set is the author's qualitative analysis of the scientists' responses. The third set consists of qualitative analyses of the scientists' responses by two to five independent judges blind to the identity of the participants. The fourth data set consists of the scientists' ratings on a three-item questionnaire on the status and future of the unmodified and noncontextualized[2] noun "emotion." Communications with participating scientists and the collection of data were via email.

Participants

Distinguished scientists were selected to represent each of the various disciplines and specialties concerned with emotion theory and research. Of those who agreed to participate (35 of the 37 who were selected), eight are female, and the group as a whole represents four nationalities. They include a member of the National Academy of Sciences, winners of the APA Award for Distinguished Scientific Contribution, past presidents of APS, two scientist philosophers, and holders of endowed chairs at leading universities. They represent behavioral and cognitive neuroscience, computational cognitive science (artificial intelligence/robotics), and clinical, cognitive, developmental, and social psychological science. All of them have international reputations and have made significant contributions to research in the emotion domain. They include authors of several frequently cited emotion theories. Although they represent multiple disciplines, theoretical positions, and lines of research, they are by no means a statistically representative sample or an exhaustive list of distinguished emotion researchers.

The judges who did the qualitative analyses of the scientists' statements on the definition, activation, and primary function of "emotion" are one cognitive scientist, two clinical scientists, one clinical psychologist practitioner, and a postdoctoral fellow and two doctoral candidates in the author's emotions research laboratory.

Procedure

The author sent the following six-question survey to the 35 distinguished scientists:

1. What is an emotion?
2. What is the primary function of emotion?
3. What activates an emotion?
4. How is emotion most effectively regulated?
5. Are there rapid, automatic, and unconscious connections among emotion, cognition, and action?
6. What is another question that we should raise for research and discussion?

The author did an initial qualitative analysis looking for common structural and functional aspects attributed to "emotion" in the 34 scientists' definitions. In a follow-up question to the participating scientists, the author asked them to select a number on a scale from 1 (Not at all) to 10 (Completely) to indicate the extent to which they agreed that each aspect identified was a structure or function of emotion.

A panel of two clinical scientists, one cognitive scientist, a clinical psychologist practitioner, a postdoctoral fellow, and two clinical science graduate students independently categorized the scientists' definitions of "emotion." After the judges completed their initial qualitative analyses of the definitions, two of them completed a checklist that measured the extent to which the structural and functional aspects of emotion identified by the author matched the contents of their categorical analyses. The checklist items consisted of the aspects of emotion identified by the author plus three pseudo aspects. These two judges were asked to place a plus sign by each author-identified aspect they could find in the scientists' definitions, a second plus sign if they could find it in their own analysis of the scientists' definitions, and a minus sign if they could not find the aspect. Similar procedures were used in the qualitative analyses of the scientists' answers to the questions on the activation and function of emotion.

Finally, the author sent an early draft of this article to all participating scientists and asked them to answer a three-item questionnaire on the current status and future use of the stand-alone noun "emotion" in the scientific literature.

Results

Thirty-four of the invited scientists responded to the first three questions on the 2006 six-item questionnaire, 33 to the fourth, 35 to the fifth, and 31 to the sixth. (A Microsoft Word document containing their verbatim responses to each question is available from the author.) Several of the scientists expressed reluctance in attempting to answer the question calling for a definition of "emotion." Twenty-seven of the participants responded to the 2008 three-item follow-up questionnaire on the status and future of the unmodified and noncontextualized noun "emotion" in scientific literature.

Structures and Functions of Emotion in the Participating Scientists' Definitions

The author's initial qualitative analysis of common aspects in the 34 scientists' definitions identified six concepts which he conceived as representing relatively more structural aspects and nine considered as relatively more functional aspects. The participating scientists' ratings showed moderate to high agreement that the structural and functional aspects identified by the author's qualitative analysis of all 34 definitions were indeed structures and functions of emotion. Tables 1 and 2 display the results for the 24 who completed the ratings.

Independent Judges' Qualitative Analysis of the Scientists' 34 Definitions

Seven judges independently categorized the various aspects of the scientists' definitions of emotion. The results in Table 3

Table 1. Scientists' agreement on the structures of "emotion"

Structures	Mean rating
Neural systems dedicated at least in part to "emotion" processes	8.92
Response systems	8.61
Feelings or feeling state	7.84
Expressive behavior, signaling system	6.56
Antecedent cognitive appraisal	6.54
Cognitive interpretation of a feeling state	4.79

Note: Mean ratings on degree of agreement on a scale from 1 (Not at all) to 10 (Completely).

Table 2. Scientists' agreement on the functions of "emotion"

Functions	Mean rating
Recruits response systems	8.87
Motivates cognition and action	8.23
Organizes, orders, coordinates responses	7.78
Monitors or assesses significance of events	7.77
Provides information or meaning	7.35
Relational	6.82
Social	6.38
Controls responses	6.22
Motivates behavior characterized primarily as approach or withdrawal	4.96

Note: Mean ratings of degree of agreement on a scale from 1 (Not at all) to 10 (Completely).

reveal little agreement among faculty members of a clinical science program on the number and substance of definitional aspects in the participating emotion scientists' definitions. There was substantial agreement among the clinical science faculty member who generated the longest list of definitional aspects, the postdoctoral fellow, two graduate students in the author's laboratory, and the practicing clinical psychologist. The number of categories that these judges identified ranged from three to 11. Using the list of categories derived by the judge who generated the largest number of categories (11) as an arbitrary base for comparison, the percentage of agreement between the target list and the list of each of the other judges ranged from 0% to 54%. The mean percentage agreement was 25%.

One of the two judges who checked whether the 15 structures and functions (see Tables 1 and 2) of "emotion" identified in the author's qualitative analysis of the scientists' definitions (Tables 1 and 2) were represented in the contents of her own qualitative analysis found complete agreement on 14 of those structures and functions and partial agreement on the 15th. The other judge showed complete agreement on 13 of the 15 elements.

The Scientists' Descriptions of the Functions of "Emotion"

The author's qualitative analysis of the 34 scientists' responses led to the identification of six broad and relatively distinct functions of "emotion" and a statement indicating that different emotions have different functions.

1. Interrupts/changes ongoing processing and focuses attention and direction of responses.
2. Motivates cognition and action and provides emotion information (including evolutionarily conserved communi-cative signals) to guide and coordinate the engagement of the individual in the physical and social environment for coping, adaptation, affiliation, and well-being.
3. Increases (or decreases) salience or value of an event to facilitate adaptive (or maladaptive) associations between context, event, emotion feeling, and response.
4. Contributes to emotion and behavior regulation, well-being, and the safeguarding of sensitivities and concerns.
5. Social signaling, communication.
6. Provides a neural (often conscious) workspace for assembling solutions under the influence of emotion feelings that may range from mild to urgent.
7. Different emotions and different structures of each emotion have different functions.

Table 3. Judges' agreement on the aspects of participating scientists' definitions of "emotion"

	Agreement of other judges with judge A					
Aspects identified by judge A	B	C	D	E	F	G
Organized set of responses				√	√	
Physiological component			√	√		√
Behavioral or expressive component			√			√
Subjective feeling component			√	√		√
Cognitive component				√		√
Appraisal processes						
Motivational function or action impulse			√			√
Adaptive or coping function			√			√
May be unconscious				√		
Brain-related						
Each emotion is different						

Note: Judges A, B, and C are clinical-science faculty members. Judges D, E, F, and G are a practicing clinical psychologist, a postdoctoral fellow, and two clinical-science graduate students in the author's laboratory respectively.

Comparison of the author's analysis to that of each of four of the judges showed that the judges identified all of the emotion functions in the foregoing list except number seven, which proved to be unique. Three additional emotion functions were identified by the judges: influencing appraisal processes, self-monitoring, and self-growth.

The Scientists' Descriptions of the Activators of Emotion

The author's qualitative analysis of the scientists' responses identified six categories of phenomena that activate emotion or a change from one's ongoing emotion experience to another.

1. Innate and classically conditioned stimuli and other events/situations that present challenges or opportunities.
2. Cognition, including memories, images, and appraisal processes.
3. Social interactions and affiliation.
4. Goal-related activities.
5. Ongoing emotion–cognition interactions.
6. Spontaneous changes in neurobiological systems/processes.

The first judge also found six categories of activators which were essentially identical in substance to those of the author. The second judge identified four relatively broad categories which also had essentially the same overall content as those of the first judge and the author.

The Scientists' Descriptions of Processes in Emotion Regulation

The author's qualitative analysis of the scientists' answers to how emotion is most effectively regulated revealed seven categories of processes. The participating scientists also noted that different discrete emotions may involve or require different regulatory processes (marked as number eight).

1. Spontaneous neural/neurophysiological processes (e.g., changes in levels of hormones, neurotransmitters).
2. Other emotions (e.g., interactions among emotions within the individual and emotion contagion in social situations).
3. Cognitive processes, including executive functions (monitoring, effortful control, learning/training) reappraisal, and cognitive restructuring.
4. Adaptive/constructive utilization of the energy and motivation derived from the neurobiological processes of the emotion itself.
5. Learning and developmental processes that make effective emotion–response patterns a part of personality/character.
6. Social processes: social approval/disapproval, use of shared social appraisals, seeking social support, emotion contagion.
7. Behavioral processes: managing expressive behavior, changing/shaping situations, avoidance.
8. Regulatory processes may differ for different discrete emotions.

Two independent judges categorized the scientists' responses on how emotion is most effectively regulated (see Table 4). The first judge derived eight categories that were virtually identical in substance to the author's. The second judge also derived eight categories. Six of them were virtually identical in substance to six corresponding categories derived by the other judge and the author. The content of one of her two remaining categories was unique—environmental changes (including proactive selection).

Are There Rapid, Automatic, and Unconscious Connections among Emotion, Cognition, and Action?

All 34 scientists who replied to this question answered "yes" to affirm their belief that there are rapid, automatic, and unconscious connections among emotion, cognition, and action. Several added qualifiers or comments such as the following: "Yes, also some slow, deliberate, and conscious connections …"; "Yes, but their nature is often misunderstood, as the connections are not between stimuli, actions, and such, but between the emergent meaning of stimuli in context, actions in context"; "'Action' actually connotes just that fact, whereas there is not such an automatic relation with mere behavior, which lacks that purposeful aspect; they are probably the most important part of emotion"; "I would put the matter this way—yes to the feeling–cognition link; and yes there are such connections between some actions and cognitions and feelings, although many actions are the products of conscious process (such as strategic means–ends thinking)."

Participating Scientists' Topics/Questions for Future Research

Though there may be a unique element in each of the scientists' questions for future theorizing and research, seven themes emerged and accounted for most of the information in the responses. Each of the following themes suggests substantial challenges and opportunities. Interestingly, and perhaps indicative of the robustness of current emotion research, the question on future research produced a variety of substantially different responses.

Table 4. Judges' agreement on the processes in emotion regulation identified by emotion scientists

	Agreement of other judges with judge A	
Processes in regulation identified by judge A	B	C
Spontaneous neural/neurophysiological processes	√	√
Inter- and intra-individual interactions among emotions	√	
Cognitive processes	√	√
Adaptive/constructive utilization of emotion energy		√
Learning and developmental processes	√	√
Social processes	√	
Behavioral processes	√	√
Different regulatory processes for different emotions	√	√

Note: Judge A is the author. Judges B and C are a postdoctoral fellow and a clinical-science graduate student respectively.

1. Neural architecture of different emotions and emotion processes.
2. Development and change in emotion–cognition–action connections and relations.
3. Processes in emotion regulation and emotional reactivity and their relations to the development of emotion systems, social and emotion competence, and psychopathology.
4. A dynamic systems perspective on emotion and emotional development.
5. Sex differences in emotion systems, emotion experiences, emotion–cognition–action sequences, and emotion-related personality traits and psychopathology.
6. Relations between emotion and language.
7. Working boundary for a scientific concept of emotion, or a moratorium on its use as an unmodified or noncontextualized noun.

Responses to Three Questions on the Current Status and Future Use of "Emotion"

Twenty-six of the participating scientists used the 10-point scale (1 = Completely disagree, 10 = Completely agree) to answer the three questions on the status and future of the term "emotion" in scientific writing ($N = 27$ for Question 2). The mean agreement rating was 6.2 ($SD = 3.3$) for the statement that "emotion" is ambiguous and has no status in science, 8.2 ($SD = 2.6$) for the idea that researchers should contextualize and make clear what they mean by "emotion," and 6.3 ($SD = 3.6$) for abandoning the unmodified singular noun "emotion."

Discussion

This look at scientists' sometimes reluctant attempts to define "emotion" depicts it as highly complex, and subject to different interpretations. At the same time, the scientists' responses show that our understanding of emotion has come a long way since it was declared a category of fictional causes of behavior (Skinner, 1953; cf. Panksepp, 1990). As expected, the participating scientists did not agree on a unitary definition of "emotion." However, of considerable significance for emotion science, they showed moderate to high agreement on the structures and functions of emotion.

The scientists' responses clearly showed that "emotion" has several different meanings, all apparently heuristic. The qualitative analyses of the participating scientists' responses support the idea that "emotion" has several different aspects that have proved worthy targets of research.

The finding that the meanings of "emotion" are multiple does not imply that they are unrelated or that any two of them are orthogonal. Indeed, they may be interpreted as aspects of emotion or of a particular discrete emotion. The idea that emotion (or a specific emotion) is motivational does not necessarily conflict with the idea that it has particular neural substrates and is informational, social, and relational, and monitors or assesses the significance of events, and may include appraisal processes and other forms of cognition. Similarly, that emotion recruits response systems seems quite compatible with its functions in organizing, ordering, and coordinating or controlling responses. Although many of the meanings/aspects of "emotion" have inspired empirical research, some of them may be understudied. A possible example is the cognitive and action consequences of the attention-grabbing and attention-focusing aspect of emotion. Attention-focusing temporarily pre-empts other aspects of cognitive processing and may facilitate a change in emotion experience, and thus in motivation and future cognition and action (Most, Scholl, Clifford, & Simons, 2005).

A Description of Emotion

No succinct synthesis could capture everything in the 34 definitions of "emotion" given by the participating scientists. These definitions defy complete synthesis, in part by virtue of their meaningful originality. They represent ingenious insights and intellectual nuances from each scientist's separate studies and observations, often on different aspects of emotion.

The 34 scientists' attempts to define "emotion" contained relatively distinct structures (six) and functions (nine). The structures and functions on which the scientists had a mean agreement score that rounded to 8 or higher (on a 10-point scale) help comprise the first sentence in the following description of emotion, and those with a mean score of 5 or higher help comprise the second.

Emotion consists of neural circuits (that are at least partially dedicated), response systems, and a feeling state/process that motivates and organizes cognition and action. Emotion also provides information to the person experiencing it, and may include antecedent cognitive appraisals and ongoing cognition including an interpretation of its feeling state, expressions or social-communicative signals, and may motivate approach or avoidant behavior, exercise control/regulation of responses, and be social or relational in nature.

The foregoing noteworthy and highly pluralistic description of the structures and functions of emotion is not a definition. The complexity of this description also suggests that confusion and other problems in interpretation may arise from the use of the unmodified noun "emotion." However, this description contains several heuristic meanings/aspects of "emotion."

Two findings from the current survey may represent notable gains over the past three decades in our understanding of emotions or emotion processes. Similar to an earlier survey on "emotion" (Kleinginna & Kleinginna, 1981), the present one found numerous categories of definitions. However, in contrast to the 1981 survey, when only 32 of 92 (or 35% of) definitions were multicomponent or multiaspect, virtually all the current definitions were of this type. Wide understanding and recognition of the multiaspect nature of emotion among researchers may constitute a potentially significant change in approaches to emotion research and ultimately in emotion science.

The current study revealed another finding that may signal the emergence of an advance in emotion science. In contrast to the definitions found by Kleinginna & Kleinginna (1981), many of those provided by the scientists who participated in the current study gave a definition of emotion that recognized

(a) neural circuits and neurobiological processes, (b) phenomenal experience or feeling, and (c) perceptual-cognitive processes as aspects of emotion.

In reply to the email containing a draft of this article and a three-item (10-point scale) questionnaire relating to the status and future of the unqualified noun "emotion" in scientific research, the participating scientists showed wide individual differences (two selecting Option 1 and four selecting Option 10 to show complete agreement and complete disagreement, respectively). This finding seems to make it difficult or impossible to conclude that "emotion" meets the standards of a scientific construct. Though Gödel's theorem reminds us that scientists often find it necessary to study indefinable or fuzzy concepts, the current group of scientists showed considerable concern about the ambiguity and scientific status of the unqualified noun "emotion." Their ratings were above the midpoint of the agreement scale on all three items that questioned the integrity of the term. Their mean agreement of 8.1 on the need to contextualize the noun "emotion" and specify the meaning being attributed to it seems to be a clear and helpful message for future research in the emotion domain. It follows that researchers should also contextualize and specify the meaning of any discrete emotions under consideration. Taking these steps should enhance the clarity of future research in the emotion domain. Until we follow such a path consistently, scientific studies of emotion and their translation for public knowledge and practical applications may be at risk of misinterpretation and confusion.

Stronger Agreement on the Functions of Emotion

The scientists' responses contained a wide range of specific and general functions of emotion, but there was substantial agreement among them. Their responses are consistent with the proposition that emotions have multiple and quite significant functions in motivating and focusing individual endeavors, social interactions, and the development of adaptive and maladaptive behavior.

Our qualitative analyses suggest that in contrast to the problem of defining "emotion," there is rather high agreement on the functions of emotion. The description of emotion functions contained common themes that can guide future research. Although there was no question on the survey about it, several of the participating scientists volunteered that different discrete emotions have different functions.

Activation of Emotion

There was substantial agreement among the scientists' descriptions of processes that activate emotion. The description of each of these activators has a unique element or emphasis that can lead to distinct hypotheses for testing its validity.

Emotion Regulation

The 33 scientists' responses (only 33 of 34 scientists responded) were easily reduced to eight relatively distinct processes or techniques for emotion regulation (Table 4). Each of these processes offers possibilities for hypothesis testing relating to their parameters and validity. The participating scientists also noted that different discrete emotions may involve different regulatory processes.

All the scientists agreed that there are rapid and automatic connections among emotion and cognition. They also agreed that such processes may operate unconsciously (or perhaps more precisely at a level of awareness that is not accessible for verbal report). Assumedly, these automatic and linguistically inaccessible processes have implications for emotion activation, emotion regulation, and emotion utilization. The scientists noted that there are innumerable conscious emotion–cognition connections as well.

Questions for Future Discussion and Research

The scientists raised seven relatively distinct and interesting topics for future discussion and research. Regarding future research on the topic of the neural architecture of emotions, Sloman (A. Sloman, personal communication, 19 November, 2008) suggested adding the topic of an abstract information-processing architecture for all mental functions. This notion may be quite appealing to the growing number of scientists who postulate continuous interaction of emotion and cognition. Extant research literature on emotions suggests that the first six of the seven identified topics are quite amenable to rigorous empirical research.

Toward Greater Clarity in Research on Emotion

Taken together, the observations of the scientists who contributed to this article make it clear that emotion functions are broad and inclusive and its activators are numerous and pervasive. "Emotion" as variously described by them is integral to adaptive and maladaptive personal and social behavior, despite the current questionable status of the unqualified term "emotion" in the scientific literature. One path toward less semantic confusion in the literature is to stop using the noun "emotion" without contextualizing it, and providing a statement of the meaning or meanings assumed by the author.

A second and complementary approach to increase semantic precision in the emotion literature is to adopt a discrete emotions approach (as many now do), and identify each discrete emotion under consideration and provide for each a statement of the meaning assumed by the author (as many do not). A possible advantage of this approach is that it should prove easier to define and provide an operational definition for a particular discrete emotion than for the general term "emotion." Such information is essential to replication of findings across laboratories, which is relatively rare in the extant literature. The discrete emotions approach does not preclude acknowledging that distinctions among emotions are often difficult because of their frequent interactions and permeable boundaries. The discrete emotions approach toward resolving the problems of the polysemous noun "emotion" received unsolicited explicit or implicit support from several participants in the present study. The

responses of several of the scientists noted that answers to the six questions posed in the present survey would differ for each discrete emotion. Extant literature suggests that it is feasible to qualify, contextualize, and define functionally discrete emotions like interest, joy, sadness, anger, fear, shame, and guilt. Moreover, it shows that "emotion" works quite well as an adjective. For example, emotion knowledge, emotion regulation, emotion arousal, and emotion reactivity can be given operational definitions in terms of the methods used to elicit and measure them.

Conclusion

The evidence showing that "emotion" has no generally accepted definition seems a clarion call for researchers who continue to use the term to provide their own operational definition, or at least specify what they mean by the term. The present article may suggest to some readers, that how rapidly and smoothly emotion science progresses will depend in part on the willingness of researchers to contextualize the term "emotion" or the label for any of the discrete emotions under investigation, and specify the meaning attributed to it.

Future research on discrete emotions and their functions, and on emotion (when it can be appropriately contextualized and operationally defined), seems to hold unlimited promise for advancing psychological science. Such research should continue to increase our understanding of the pervasive and perhaps continuous influence of specific emotions or patterns of interacting emotions on thinking, learning, decision-making, action, and the development of social and emotion competence, personality, and psychopathology.

Notes

1 Throughout this article, emotion refers to brain and body processes, and "emotion" to a term in current terminology of emotion science.

2 As used in this article, the idea of contextualizing the term emotion means giving descriptions of the factors which are present in the context (e.g., of an experiment) that might influence the emotion process under consideration.

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Appendix

Readings Suggested by Participating Scientists to Represent their Theoretical Position or Research

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